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Thomas J. O'Keefe

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EXAMINER

LEADER, WILLIAM T

ART UNIT

PAPER NUMBER

1795

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/799,905	<b>Applicant(s)</b> O'KEEFE ET AL.	
	<b>Examiner</b> WILLIAM T. LEADER	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 May 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-5,9-11,13-19,27,44,48-51,53,55,58 and 60-74 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-5,9-11,13-19,27,44,48-51,53,55,58 and 60-74 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 18, 2009, has been entered.
2. The amendment after the final office action of March 20, 2009, has been entered. New claims 60-74 have been added. Claims 1, 3-5, 9-11, 13-19, 27, 44, 48-51, 53, 55, 58 and 60-74 are pending.
3. The declaration under 37 CFR 1.132 filed June 8, 2009, is sufficient to overcome the rejection of the claims based upon the Li et al document.
4. The amendment filed on June 8, 2009, is deemed to have overcome the rejections of record under 35 U.S.C. 112. However, the amendment raises new issues under 35 U.S.C. 112 as set forth below.

### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1, 3-5, 9-11, 13-19, 27, 44, 48-51, 53, 55, 58 and 60-74 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Applicant has amended independent claim 1 to add after the recitation “spontaneously displacing the active substrate with the desired deposition galvanic coating component” the new limitations “and creating seed particles disposed on the substrate in a localized range, the seed particles comprising an activating species; and continuing plating the desired deposition galvanic coating component from the non-aqueous organic solution onto the activated substrate and seed sites.”

The scope of these newly added limitations is not clear. The step of “creating seed particles” is written as a continuation of the limitation “spontaneously displacing”. It is not clear if the newly recited step of “creating seed particles” is a part of the “spontaneously displacing” step (i.e., the seed particles are created by spontaneously displacing), or is a separate step in addition to the “spontaneously displacing” step. If it is a separate step, it is not clear when this step occurs with respect to the “spontaneously displacing” step, i.e., before or after. If it is a separate step, it is additionally not clear what actual process step is performed to create the seed particles.

8. It appears that the “continuing” step is intended to be a continuation of the “spontaneously displacing” step since this step plates from “the non-aqueous organic solution” which is the same solution used to carry out the “spontaneously displacing” step. If the “continuing” step is interpreted to be a continuation of the “spontaneously

displacing” step, it is not clear where one step ends and the other begins. As stated at page 11, lines 3-5 of applicant's specification "Noble metal atoms 18 (e.g. gold atoms) begin to deposit on active substrate 14. At a later stage (Fig. 1c) deposited noble metal atoms 18 cover active substrate 14, preferably forming a noble metal film layer (e.g. a gold film layer)." From this description, deposition begins at localized sites on the substrate as shown in fig. 1b. These initial deposits may be considered to be in the form of particles. Deposition continues until a complete layer which covers the active substrate is formed. It is not apparent where the step of creating particles becomes the step of continuing plating.

9. The meaning of the new limitation “the seed particles comprising an activating species” is not clear. The term “activating species” does not appear to have been used in the specification. It is not apparent what the "activating species" is intended to provide activation for. Claim 1, line 2 already recites that the substrate is “active.” Page 10, lines 21-22 of the specification state that “Figs. 1a-1c illustrate the mechanism for deposition of noble metals from an organic solution onto a more active, or less noble, metal surface substrate, over time.” Based on the specification “active substrate” as recited in claim 1, line 2 is interpreted by the Examiner to mean a substrate which is sufficiently active to allow the spontaneous displacing recited in claim 1, line 7 to occur. If the substrate is not active, i.e. less noble than the metal to be deposited by displacement, then the displacement recited in claim 1, line 7 will not occur. It is not clear what materials are included within the scope of “activating species”. If "activating species" includes a

material other than the desired deposition galvanic coating component, it is not clear where these other materials come from.

10. In claim 1, line 11 the expression "the activated substrate" lacks antecedent basis. As noted above, claim 1, lines 2 recites "active substrate". It is not clear if "the activated substrate" of line 11 is intended to refer to the "active substrate" of line 2 or something different.

11. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

12. Claims 1, 3-5, 9-11, 13-19, 27, 44, 48-51, 53, 55, 58 and 60-74 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

13. As previously noted, applicant has amended claim 1 to recite that the seed particles comprise an 'activating species'. Basis for this limitation in the specification as filed is not apparent.

14. Again, as previously noted, applicant has amended claim 1 to recite the additional step of "continuing plating the desired deposition galvanic coating component from the non-aqueous organic solution onto the activated substrate and seed sites." At page 11 of

the Remarks, applicant states that "Fang teaches aqueous electrochemical copper deposition after seeding Ti(N) and Ta(N) films with organic solution deposited copper and palladium (see Abstract)". Applicant further states that "Nowhere does Fang teach continuing plating from a non-aqueous organic solution." As pointed out in the final office action, Fang teaches the formation of a seed layer by displacement plating from an organic solution. See page 137 of Fang. Applicant's Remarks appear to indicate that the newly recited step of "continuing plating" is directed to the deposition of additional material by displacement plating from an organic solution after the formation of a seed layer by displacement plating from an organic solution. Applicant's specification does not describe such a step if layer is considered to be a film which covers the active substrate. Continued plating by a displacement plating process after formation of an initial layer which completely covers the substrate is contrary to the accepted mechanism of displacement plating. As explained at pages 14 and 15 of applicant's specification a cementation reaction (displacement reaction) involves using a less noble metal to serve as a reducing agent for a more noble cation. From this teaching it is clear that once a complete layer of the more noble metal has formed, the less noble is no longer exposed to the plating solution and the displacement reaction will cease. This phenomenon is disclosed by the Fang et al article where it is stated that the process is self-limiting in thickness. "The reaction stops once the less noble metal surface has been covered by the more noble metal." See page 138. The Lowenheim text *Electroplating*, of record, indicates that the terms displacement, cementation and immersion plating are synonymous (page 389). In a manner similar to Fang, Lowenheim teaches that for

displacement plating “the thickness of deposits obtainable is usually extremely limited, because as soon as the substrate metal is completely, or almost completely, covered by the deposit, the reaction stops or slows down to the rate at which substrate metal is available through pores or discontinuities in the coating.” See page 411.

15. Claims 1, 3-5, 9-11, 13-19, 27, 44, 48-51, 53, 55, 58 and 60-74 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

16. As indicated above, based on applicant’s arguments claim 1 as amended may be interpreted to require the step of continuing deposition of a desired deposition galvanic coating component from an organic solution by displacement coating after an initial seed layer has been deposited by from the organic solution. This continued deposition is contrary to the conventional understanding of displacement coating as disclosed by Fang et al and Lowenheim which teach that as soon as the substrate is covered by a thin layer, displacement plating stops. The prior art of record is indicative of the level of one of ordinary skill in the art. Applicant has not provided a disclosure which would enable one of ordinary skill in the art to continue displacement plating after the formation of an initial layer.

17. New claim 71 (which corresponds to canceled claim 36) recites a least one organic additive selected from a group which is simply a list of major classes of organic



compounds. Basis for this limitation in the specification appears to be page 8, lines 16-18 which similarly lists the same classes of organic compounds. Applicant has provided no guidance in the specification and has not pointed to other documents which would enable one of ordinary skill to choose a particular compound which would enhance deposit characteristics from among the thousands of organic compounds included within the recited classes of organic compounds. Determination of suitable compounds would require undue experimentation. See MPEP 2164.

***Claim Rejections - 35 USC § 102***

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

18. Claims 1, 3-5, 9-11, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70, 72 and 73 are rejected under 35 U.S.C. 102(b) as being anticipated by the Fang et al article.

19. The Fang et al article is directed to a process for depositing a seed metal. A Ti, TiN, Ta or TaN barrier film was deposited onto Si or SiO wafer substrates. The deposited film formed an active substrate. See the "Experiment" section of the article at page 139. This corresponds to the first step of applicant's claimed process as recited in instant claim 1. Metal films of Cu or Pd seed materials, which allowed subsequent electroless or electrolytic deposition, were deposited from organic solutions based on a displacement plating process. See the abstract. In a displacement or immersion plating processes a bath containing more electrochemically noble metal ions is placed in contact with a metallic surface or substrate that is less electrochemically noble. The less noble

metal dissolves at the same time as the more noble metal ion deposits on the surface, thereby “displacing” less noble metal on the original surface into solution. In the work described in the article, the immersion displacement reactions were conducted in organic electrolytes. See the “Introduction” section of the article at pages 137-138. The displacement reaction in the organic solution described by Fang et al corresponds to the spontaneous displacing step recited in claim 1. Fang teaches that due to the limited conductivity, the reactions are very localized. The displacement of less noble material from the surface with noble metal from the solution would have been expected to begin at local deposition sites on the substrate. Initial deposition would have formed “particles” at the local deposition sites. This corresponds to applicant’s step of creating seed particles disposed on the substrate in a localized range. Fang discloses that deposition is continued until the less noble surface has been covered by the more noble metal. This corresponds to the continuing step recited by applicant. All steps recited in claim 1 are present in the process disclosed by Fang et al.

20. With respect to claims 3, 4 and 5, Fang discloses the deposition of copper and palladium.

21. With respect to claims 9 and 10, as noted above, the substrate of Fang comprises a metal or metal-containing compound (Ti, TiN, Ta or TaN).

22. With respect to claim 11, Fang et al disclose that metals have been deposited from organic solutions onto substrates such as aluminum, zinc, iron, titanium and gallium arsenide. See page 139, lines 3-6.

23. With respect to claim 14, Fang et al disclose the use of a nitride barrier layer.

24. With respect to claim 15, Fang et al disclose treating the substrate by etching before seeding. See the last paragraph on p 139.

25. With respect to claim 27, in metal solvent extraction, the transfer of cations between the aqueous and organic phases is based on a chemical driving force gradient. Equation (1) shows that the organic solvent functions as a cation exchange reactant.

26. With respect to claim 44, Table 1 shows the open-circuit potentials of metal electrodes in various organics at 25°C. This temperature may be considered to be at an ambient level.

27. With respect to claim 48, Fang et al disclose the inclusion of a 2 vol% aqueous activating addition. See page 139, last paragraph. This falls within the range of less than 5 vol%.

28. With respect to claim 49, the disclosure of organic solvents at page 138 does not specify the addition of any water.

29. Claim 50 is interpreted in accordance with page 12, lines 1-3 of the specification which discloses removing a surface coating of a barrier layer. The preliminary etching of Fang et al would have removed a surface coating from the barrier layer.

30. With respect to claim 51, material from the barrier layer would have been displaced.

31. With respect to claim 53, Fang et al discloses deposition onto Ti(N) and Ta(N). See the abstract.

32. With respect to claim 55, Fang et al show an example of loading the organic solution with the deposition component such as Cu in equation (1) on page 138. The

deposition component was then removed from the organic solution using a metal as reducing agent (page 138).

33. With respect to claim 58, the Cu would have been reduced as cations.

34. With respect to claim 60, Fang discloses the deposition of metal ions. See page 138, line 2.

35. With respect to claims 63 and 64, Fang discloses etching the barrier layer with hydrofluoric acid prior to the deposition step. See page 139, last paragraph.

36. With respect to claim 66, the organic solution of Fang included an organic solvent such as D2EHPA (the same solvent used in applicant's example A) and organic diluent and would have been a single phase.

37. With respect to claim 67, Fang discloses mixing by injecting nitrogen. See page 139, last paragraph.

38. With respect to claim 69, Fang discloses adding at least one additive to the organic solution. See page 139, last paragraph.

39. With respect to claim 70, Fang teaches that the additive may be organic. See page 139, last paragraph.

40. With respect to claim 73, Fang discloses that the metal ion in solution reacts at the surface indicating that the ion was transported to the surface.

***Claim Rejections - 35 USC § 103***

41. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

42. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

43. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" alone or in view of O'Keefe (US 5,228,903).

44. Claim 13 recites the organic solution comprises at least two deposition components. In the table of page 140, Fang et al show the open-circuit potential of metals in various organic solvents. As shown, Ag and Cu have similar potentials. The O'Keefe patent is directed to galvanic stripping of a metal from an organic solution loaded with the metal by displacement coating onto a solid substrate metal substrate.

O'Keefe discloses that more than one metal may be deposited onto the solid substrate metal (column 6, line 60 to column 7, line 2.) Deposition of more than one metal such as Ag and Cu as suggested by Fang and combinations of metals disclosed by O'Keefe would have been obvious because properties of both deposited metals would have been obtained.

45. With respect to claim 61, Fang discloses that layers comprising a non-metallic element, such as TiN, are useful. Deposition of such as useful layer would have been obvious.

46. Claims 16-19, 62, 65 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" as applied to claims 1, 3-5, 9-11, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70 and 73 above, and further in view of the Lowenheim text *Electroplating*.

47. Claim 16 recites introducing a halogenated compound into the organic solution while claim 17 lists halogenated compounds. Fang et al discloses adding organic diluents and other organic activators or additives. See the last paragraph on page 139. In Table 18-1 at page 412, Lowenheim discloses immersion (displacement) plating baths with various additives. Thus, both Fang and Lowenheim disclose the incorporation of additives into the displacement plating solution. The additives disclosed by Lowenheim include halogenated compounds such as HCl and SnCl<sub>2</sub>. Claim 18 recites introducing a

non-halogenated compound into the organic solution while claim 19 recites that non-halogenated compound comprises H<sub>2</sub>SO<sub>4</sub>. In Table 18-1 Lowenheim discloses that sulfuric acid may be included as an additive in displacement plating baths. Claims 62 and 72 recite including an acid or a base in the organic solution. Sulfuric acid as disclosed by Lowenheim is an acid falling within the scope of these claims. It would have been obvious at the time the invention was made to have included in the displacement plating bath of Fang compounds shown by Lowenheim to be useful in displacement baths.

48. Claim 65 recites *in-situ* etching. Inclusion of sulfuric acid in the displacement plating bath as suggested by Lowenheim would have resulted in *in-situ* etching.

49. Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" as applied to claims 1, 3-5, 9-11, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70 and 73 above, and further in view of the Lowenheim text *Modern Electroplating* and Cimermancic et al (6,284,123), both of record (cited in the office action of July 21, 2007).

50. Claim 68 recites the use of ultrasonic agitation. The Lowenheim text teaches that agitation increases transport of ions being deposited (page 21). The Cimermancic et al patent is directed to electroplating and discloses that agitation of the plating bath may be by ultrasonic agitation (column 7, lines 59-62). It would have been obvious to have agitated the plating bath of Miura et al as shown by Lowenheim because transport of

depositing ions would have been improved. The use of ultrasonic agitation would have been obvious because it is shown by Cimermancic et al to be effective in agitating a plating bath.

51. Claim 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article “An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals” as applied to claims 1, 3-5, 9-11, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70 and 73 above, and further in view of the Lowenheim text *Electroplating*, of record, and Satow (US 5,597,975), newly cited.

52. As noted above, Fang discloses the inclusion of organic additives in an organic displacement plating bath. The Lowenheim text discloses that a wetting agent (surfactant) is useful in a displacement (immersion) plating bath. See Table 18-1. The Satow patent is directed to a plating process and teaches that ethoxylated aliphatic alcohols are useful as surfactants (see column 4, line 40). It would have been obvious at the time the invention was made to have included an alcohol in the plating bath of Fang because Fang teaches the inclusion of organic additives, Lowenheim teaches that a wetting agent is a useful additive in a displacement coating solution (page 412), and Satow discloses that ethoxylated aliphatic alcohols are known as wetting agents useful in plating baths.

53. Claim 74 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article “An Alternative Metallic Seeding Technique for Subsequent Electrochemical



Deposition of Copper onto Barrier Metals” as applied to claims 1, 3-5, 9-11, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70 and 73 above, and further in view of O’Keefe (US 5,228,903).

54. Claim 74 recites the use of an elevated pressure. The O’Keefe patent is directed to galvanic stripping of a metal from an organic solution loaded with the metal by displacement coating onto a metal substrate. O’Keefe discloses that it is known to utilize elevated pressures in removing metal from an organic solution, but that the use of high pressures may be eliminated when using displacement coating from an organic solution (column 3, lines 37-41). The use of a non-preferred embodiment of O’Keefe in the displacement coating process of Fang et al would have been obvious since the use of higher pressures is known to have been useful and would have altered process characteristics such as solubility.

### ***Response to Arguments***

55. Applicant’s arguments have been carefully considered by are not deemed to be persuasive. As noted above, at page 11 applicant argues that Fang teaches aqueous electrochemical copper deposition after seeding Ti(N) and Ta(N) films with organic solution deposited copper and palladium. Applicant argues that the claims have been amended to recite continuing plating and argues that nowhere does Fang teach continuing plating from a non-aqueous organic solution. For the reasons given above, it is the Examiner’s position that as interpreted by the Examiner, applicant’s arguments are not

consistent with the specification as filed and are contrary to the accepted understanding of displacement coating, i.e. once an initial layer has been formed by displacement coating, deposition will cease and can no longer be continued. Consequently, the arguments are not considered to be convincing.

56. It is also the Examiner's position that claim 1 may be interpreted in a manner other than that argued by applicant and which is consistent with the conventional understanding of displacement plating. This interpretation is explained as follows. In comparing the claims with the prior art, the claims are interpreted as corresponding to applicant's Fig. 1 and to example A at pages 18 and 19 of the specification. Fig. 1a shows the provision of an active substrate and contact of the substrate with a non-aqueous organic solution comprising a desired coating component which has a more noble composition than the active substrate. See the description of Fig. 1a at page 10, lines 21-23 of the specification. This corresponds to the first two steps recited in claim 1, lines 2-5. Fig. 1b shows noble metal atoms reduced at cathodic sites on the active substrate. See page 10, line 24 to page 11, line 2. It is the Examiner's position that these reduced atoms at cathodic sites may be considered to be particles and that this corresponds to lines 7-9 of claim 1. Figure 1c shows continuing plating from the non-aqueous organic solution onto the substrate. See page 11, line 3-5. This corresponds to the last step recited in claim 1.

57. Example A at pages 18-19 discloses the deposition of palladium from an organic solution onto a substrate which was a silicon wafer coated with a barrier layer of TiSiN. The substrate was introduced into an organic solution containing palladium ions. When

the samples were removed, palladium was detected on the surface. It is the Examiner's position that the layer of palladium was formed by the mechanism described in Fig.1 a-c and may be considered to be a seed layer. Applicant's claim 1 as amended is considered to recite a process that corresponds to applicant's Example A. Example A concludes with the statement "Once the Pd was present, the surface was active for deposition of a copper thin film using conventional, available technology such as electrolytic and electroless deposition." That is, additional deposition after the formation of the Pd seed layer was by electroless or electrolytic deposition. This is the same process disclosed by Fang.

58. At the bottom of page 11 of the Remarks, applicant argues that Fang teaches away from plating from an organic solution and teaches continuing plating from a conventional aqueous electrochemical solution. This argument is not convincing. The teaching of Fang to plate additional material from a conventional aqueous electrochemical solution is the *same* teaching that appears at the end of applicant's example A.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM T. LEADER whose telephone number is (571) 272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/William Leader/  
August 21, 2009

/PATRICK RYAN/  
Supervisory Patent Examiner, Art Unit 1795